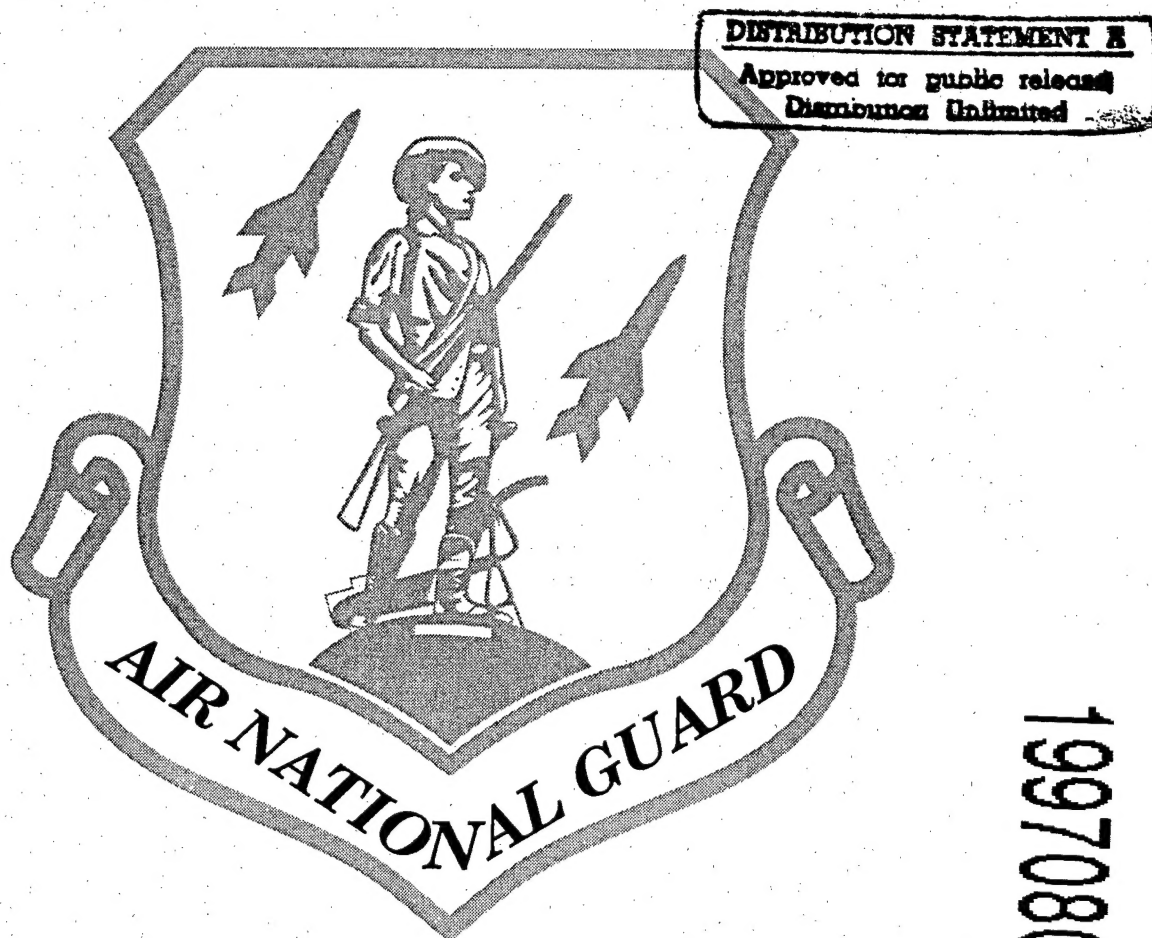


# **Startup Report for Ground Water Extraction, Treatment, and Recharge System**

**162nd Fighter Wing  
Arizona Air National Guard  
Tucson International Airport Superfund Site  
Tucson, Arizona**

**June 1997**



**ANG/CEVR  
Andrews AFB, Maryland**

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The document presents startup procedures, observations and measurements conducted during the startup of the Groundwater Extraction, Treatment and Recharge System, built for the 162nd Fighter Wing, Air National Guard Base, Tucson, Arizona. The report includes the following:

- Documentation that the treatment system meets the required operational efficiency defined by the project requirements;
- Verification of the correct operation of the treatment system's non-recoverable emergency shut down controls;
- Verification of the correct operation of the treatment system's recoverable (non-emergency) shut-down controls; and
- A description of operational checks performed for various system equipment components.

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**June 1997**

**Prepared For:  
ANG/CEVR  
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## LIST OF ACRONYMS

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<u>Acronym</u>	<u>Definition</u>
AANG	Arizona Air National Guard
CFM	cubic feet per minute
EPA	United States Environmental Protection Agency
ERM	ERM-West, Inc.
FCV	flow control valve
GPH	gallons per hour
GPM	gallons per minute
HVOC	halogenated volatile organic compounds
LEW	lower extraction well
PPB	part per billion
PLC	programmable logic control
TCE	trichloroethylene
UEW	upper extraction well
µg/l	micrograms per liter

## SECTION 1.0

---

# INTRODUCTION

ERM-West, Inc., (ERM) has prepared this System Startup Report as part of construction oversight, startup services, operations & maintenance, and monitoring services for the ground water remediation system at the Arizona Air National Guard (AANG) Base in Tucson, Arizona. This work was performed under contract DAHA90-94-D-0014 between ERM and the National Guard Bureau, Departments of Army, and Air Force.

During extraction well development and pump performance testing, five holding tanks (designated as tanks A through E) were used. In March 1997, following laboratory analysis and EPA approval, the ground water contained in holding tanks A, B, and C was re-injected directly into the recharge wells. Results indicated TCE concentrations were non-detect (<1.0 ppb). Holding tanks D and E were used during Phase 1 of the treatment system efficiency verification discussed in Section 2 of this report.

This System Startup Report documents startup procedures and equipment verifications conducted for the ground water extraction, treatment, and recharge system located at the Tucson AANG Base in Tucson, Arizona. This System Startup Report includes the following:

- Documentation that the treatment system meets the required operation efficiency defined by the project requirements.
- Verification of correct operation of the treatment system's non-recoverable (emergency) shut down controls;
- Verification of correct operation of the treatment system's recoverable (non-emergency) shut down controls; and
- A description of operational checks performed for various system equipment components.

### 1.1 System Startup Report Organization

This section outlines the operations performed during the startup of the ground water treatment system and includes a chronology of these startup events. Section 2 describes the influent and effluent sampling and analysis phases conducted to verify the efficient operation of the treatment and

system. Section 3 describes the procedures performed to verify the correct operation of the system's emergency shut downs. Section 4 describes the procedures performed to verify the correct operation of the system's non-emergency shut downs. Section 5 presents problems and subsequent solutions encountered during start-up activities.

## **1.2 Chronology of Events for Treatment System Startup**

The startup of the treatment system, the efficiency and equipment verifications, and the sampling and analysis phases were performed by the Contractor, Roy F. Weston, Inc. (Weston), with oversight by ERM, from April 29, 1997, to May 2, 1997. During the week of May 5, 1997, additional sampling and analysis of influent and effluent ground water was conducted to further confirm treatment system efficiency.

A chronology and description of events conducted during the treatment system startup is presented in Table 1-1. The treatment system startup events are discussed in Sections 2 through 4.



TABLE 1-1

*Chronology of Treatment System Startup*

Date	System Startup Events
April 29, 1997	<p>A. <u>Ground Water Extraction</u>: Ground water was extracted from all extraction wells at rates between 2 gallons per minute (gpm) and 10 gpm. Treatment system effluent was discharged to a 21,000 gallon holding tank.</p> <p>B. <u>Collection of Treatment System Influent and Effluent Samples</u>: Effluent samples were collected from air stripper V-1A and V-1B sumps. An influent sample was collected from the feed surge tank T-1 sample port.</p> <p>C. <u>System Verifications</u>: Various treatment system emergency, non-emergency, and equipment operation verifications were performed. These verifications are described in Sections 3 and 4.</p>
April 30, 1997	<p>A. <u>Laboratory Verification of Treatment System Efficiency</u>: Laboratory results of treatment system influent and effluent samples verified that treatment system efficiency met the specified project requirements.</p> <p>B. <u>Treat and Reinject Ground Water in Holding Tanks</u>: Ground water contained in holding tanks is processed through the system, and reinjected into recharge wells.</p> <p>C. <u>Collect System Effluent Sample</u>: Collected effluent sample from air stripper V-1B sump. Sample consisted of water pumped from holding tanks and processed through the system.</p> <p>D. <u>Conduct Various System Verifications</u>: Various treatment system emergency, non-emergency and equipment verifications were performed. These verifications are described in Sections 3 and 4.</p>
May 1, 1997	<p>A. <u>Collect Treatment System Effluent Sample</u>: A treatment system effluent sample was collected from air stripper V-1A sump. The effluent sample consisted of treated ground water extracted from wells LEW-08 and UEW-05.</p> <p>B. <u>Conduct Various System Verifications</u>: Various treatment system emergency, nonemergency and equipment verifications were performed. These verifications are described in Sections 3 and 4.</p>
May 2, 1997	<p>A. <u>Collect Treatment System Effluent Samples</u>: Treatment system effluent samples were collected from air stripper V-1A sump. The effluent samples consisted of treated ground water extracted from wells LEW-08 and UEW-05.</p>
May 6 - 9, 1997	<p>A. <u>Collect Treatment System Influent and Effluent Samples</u>: One system influent ground water sample and two system effluent samples were collected from air stripper sump V-1A and analyzed for trichloroethylene.</p>

## *TREATMENT SYSTEM EFFICIENCY VERIFICATION*

The construction contract for the Tucson Ground water Extraction, Treatment and Recharge System Project specifies that the extracted ground water be treated to a trichloroethylene (TCE) concentration of 1.0 micrograms per liter ( $\mu\text{g/L}$ ) or less. To verify treatment efficiency, influent and effluent samples of ground water were collected by ERM and analyzed for halogenated volatile organic compounds (HVOCs) using the Environmental Protection Agency (EPA) Method 8010.

Verification of treatment efficiency was performed in the four sampling and analysis phases summarized below:

- Phase 1 Ground water from the extraction wells was treated and discharged into temporary holding tanks D and E. These holding tanks contained additional ground water generated during extraction well performance testing. Treatment system, influent and effluent samples were collected and analyzed for HVOCs.
- Phase 2 Ground water contained in the holding tanks was processed through the treatment system and re-injected into recharge wells. A sample of the treated ground water was collected and analyzed for HVOCs.
- Phase 3 Ground water from all the extraction wells LEW-08 and UEW-05 was treated and re-injected into the recharge wells. Two samples of treated ground water were collected and analyzed for HVOCs.
- Phase 4 Ground water from all of the extraction wells was treated and re-injected into the recharge wells. Samples of both ground water influent and effluent were collected and analyzed for HVOCs.

Analytical results for samples collected during each of these phases are detailed in Table 2-1. Complete laboratory reports are included in the Appendix.

TABLE 2-1

**Ground Water Treatment System Startup  
System Influent and Effluent Sample Results  
162nd Fighter Wing, Arizona Air National Guard  
Tucson ANG, Tucson, Arizona**

Phase	Sample Type	Sample Date	Sample Identification	Sample Point	TCE Concentration µg/l	Lab Identification Numbers
Pre Start-up Sampling	Contents of Holding tanks	3/18/97	A	Tank A	ND<0.5	031897-17
		3/18/97	B	Tank B	ND<0.5	031897-17
		3/18/97	C	Tank C	ND<0.5	031897-17
		3/18/97	D	Tank D	2.5	031897-17
		3/18/97	E	Tank E	1.5	031897-17
1	Influent/Effluent	4/29/97	INF	Sample Port at Feed Surge tank, T-1	17.7	042997-12
		4/29/97	V-1A	Air Stripper V-1A Sump	ND<1.0	042997-13
		4/29/97	V-1B	Air Stripper V-1B Sump	ND<1.0	042997-11
2	Effluent	4/30/97	B-EFF	Air Stripper V-1B Sump	ND<1.0	043097-10
3	Effluent	5/1/97	5-1-97-V1A	Air Stripper V-1A Sump	ND<1.0	050197-16
		5/2/97	5-2-97-V1A	Air Stripper V-1A Sump	ND<1.0	050297-01
		5/6/97	1	Air Stripper V-1A Sump	ND<1.0	050697-02
4	Influent/Effluent	5/9/97	Stripper In	Sample Port at Feed Surge Tank, T-1	18.3	050997-11
		5/9/97	Stripper Out	Air Stripper V-1A Sump	ND<1.0	050997-12

Samples collected on 3/18/97 analyzed by Environmental Protection Agency (EPA) Method 601. All other samples analyzed by EPA Method 8010.

TCE - trichloroethene

ppb - parts per billion

ND<0.5 - TCE not detected at or above the detection limit of 0.5 µg/l.

ND<1.0 not detected at or above the detection limit of 1.0 µg/l.

## **2.1 Phase 1**

---

Phase 1 was conducted on April 29, 1997. The purpose of Phase 1 was to confirm the removal of TCE from influent ground water to a concentration below one part per billion (1 ppb) prior to recharge. Accordingly, one influent ground water sample was collected from the sample port at feed surge tank T-1, and one effluent sample was collected from each of the air stripper sumps, V-1A and V-1B.

Ground water was extracted from each of the extraction wells during this phase. Extraction rates varied from 2 gallons per minute (gpm) to 10 gpm. Extracted ground water was processed through the treatment system and discharged into holding tanks D and E. Approximately 3000 gallons of ground water were extracted from extraction wells, processed through the system, and discharged to holding tanks D and E.

Analytical results for influent and effluent samples collected during Phase 1 are summarized in Table 2-1. The influent sample collected at feed surge tank T-1 contained a TCE concentration of 17.7 ppb, while effluent sample results reported non-detectable levels of TCE. No other HVOCs were detected in influent or effluent samples.

The analytical results of the effluent samples collected during this phase, verified that the operation of the treatment system, was in accordance with the remedial objectives and in accordance with the contract requirements. Therefore, Phases 2, 3, and 4, which involved recharge of extracted ground water to reinjection wells, was initiated on April 30, 1997.

## **2.2 Phase 2**

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Following the verification of the treatment efficiency of the ground water treatment system, the ground water contained in holding tanks D and E was pumped to the system surge tank T-1, processed through the treatment system, and recharged into the reinjection wells. The ground water was treated using air stripper V-1B. Approximately 17,000 gallons of ground water were processed through the treatment system.

The effluent sample collected from the sump at air stripper V-1B reported non-detectable levels of TCE. No other HVOCs were detected in this effluent sample. Prior to the system's startup, influent ground water samples were collected from holding tanks D and E. Analytical results for this sampling indicated that ground water in tank D contained 2.5 ppb TCE,

while ground water in Tank E contained a TCE concentration of 1.5 ppb. No other HVOCs were detected in samples collected from these two tanks. Results of the influent and effluent sampling performed during Phase 2 is presented in Table 2-1.

## **2.2 Phase 3**

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On May 1, 1997, following the treatment and reinjection of the ground water contained in holding tanks D and E, ground water extraction was extracted at extraction wells LEW-08 and UEW-05 at rates of approximately 9 gpm and 5 gpm, respectively. Ground water extracted from these wells was processed through air stripper V-1A. A sample of treated ground water was collected from the sump at air stripper V-1A approximately 4 hours following the initiation of extraction from these two wells. A second sample was collected from the sump at air stripper V-1A approximately 20 hours following initiation of extraction at these two wells. HVOCs were not detected in treated water samples collected during these two sampling events.

## **2.4 Phase 4**

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Additional influent and effluent samples were collected during the second week of treatment system operation. An influent sample was collected on May 5, 1997 from the sample port at tank T-1, and effluent samples were collected from the air stripper sump at V-1A on May 5, and May 9, 1997. Neither of the effluent samples contained detectable levels of HVOCs and the influent sample contained a TCE concentration of 18.3 ppb. Analytical results for this phase are presented in Table 2-1.

# NON-RECOVERABLE SYSTEM-WIDE SHUT DOWN VERIFICATIONS

Non-recoverable (emergency) system-wide shut downs are described in the *Final Operations and Maintenance Plan for Ground Water Remediation* (ERM, August 1996). Verifications conducted for emergency system-wide shut downs consist of the following:

- Verification 1: Feed Surge Tank Level Shut Down Verification;
- Verification 2: Air Stripper System Shut Down Verification; and
- Verification 3: Off-Gas Heater High Temperature Shut Down Verification.

Procedures for conducting each of these verifications and the results of the verifications are discussed below. Each of these verifications was conducted during the treatment efficiency verification phases described in Section 2. During emergency shut down verification activities, several non-emergency shut downs verifications and equipment operational checks were concurrently performed.

### 3.1 Verification 1

Verification 1 was conducted on April 29, 1997. The purpose of this verification was to confirm that the water level sensors installed in feed surge tank T-1 initiated the required programmable logic control (PLC) equipment control sequences and to confirm that an emergency system shut down occurred when the water level in tank T-1 rose above the 90 percent operating level. The procedure performed during Verification 1 is described below.

Step 1: The system power was turned on. Ground water extraction pumps P-1 to P-8 began operation, and the extracted ground water was pumped into tank T-1. When the water level in tank T-1 rose to 85 percent of the operating level, blower B-1B turned on and began injecting air into air stripper V-1A.

- Step 2: As the water level in tank T-1 continued to rise, the PLC was programmed such that, after a 30-second delay following the startup of B-1B, the ground water feed pump P-9A turned on. When P-9A started, the extracted ground water was pumped from tank T-1 to air stripper V-1A for treatment.
- Step 3: Extracted ground water continued to be pumped into air stripper V-1A for treatment. When the level of treated water in the sump at air stripper V-1A rose to the 70 percent level, effluent discharge pump P-11A began operation transferring water from the treatment system to holding tanks D and E. The motor control valve FCV-1A opened as designed to allow the discharge of treated ground water from the system to the recharge wells.
- Step 4: The throttle valve on the discharge side of influent pump P-9A was closed slightly following verification of startup of effluent pump P-11A and correct operation of motor control valve FCV-1A. This resulted in the influent rate to feed surge tank T-1 being greater than the discharge from tank T-1, thus causing the water level in feed surge tank T-1 to rise. At the 90 percent operating level, extraction pumps P-1 to P-8 began to shut down in a cascading manner, in accordance with the design.
- Step 5: The ground water level in feed surge tank T-1 continued to rise. At the 95 percent level in tank T-1, the entire system shut down and the emergency alarm sounded. This emergency shut down served as verification for Verification 1: Feed Surge Tank Level Shut-Down Verification.

Following the conclusion of Step 5, the system was manually restarted, and the throttle valve on the discharge side of P-9A was opened to allow the water level in tank T-1 to decrease to below the 85 percent operating level. System valving was then switched over to air stripper sump V-1B operation, and Steps 1 through 5 were successfully performed for equipment pumps P-9B, B-1B, V-1B, P-11B and the motor control valve FCV-1B.

## **3.2 Verification 2**

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Verification 2 was conducted to ensure that the air stripper system will not operate under abnormal conditions that could potentially result in effluent not meeting discharge criteria. Abnormal operating conditions include:

- Low pressure or high pressure blower operating conditions; and

- High water level conditions in the air stripper sumps.

Associated non-emergency shut down verified as part of Verification 2 included verification that effluent pumps P-11A and P-11B shut down under low water level conditions in V-1A and V-1B sumps.

The steps below describe the sequence and verifications operational checks conducted under Verification 2.

- Step 1: During the operation of air stripper blower B-1A, the air pressure monitoring line to the low pressure switch was disconnected. This disconnection resulted in discontinuation of a pressure signal to the pressure switch, thus simulating a low pressure condition at B-1A. As a result, the emergency alarm signaled, and the treatment system shut down.
- Step 2: The system was restarted. When B-1A was operating, the valve on the discharge side of blower B-1A was closed, such that a high pressure built up on the blower discharge side. At approximately 39 psi, the emergency alarm sounded and the system shut down.
- Step 3: The system was restarted. As ground water was processed through air stripper V-1A, influent pump P-9A was manually turned off while effluent pump P-11A continued to operate. The water level in the sump of air stripper V-1A decreased to the 40 percent operating low level set point. At this set point, effluent pump P-11A shut down, thus confirming this non-emergency shut down sequence. Influent pump P-9A was then turned on and the water level in the sump at V-1A rose to the 70 percent operating level. At the 70 percent operating level, effluent pump P-11A resumed operation, thus confirming this non-emergency shut down sequence.

Each of these steps was then repeated under system operation for B-1B, V-1B, P-9B, and P-11B and the above described verifications were performed, successfully.

### **3.3 Verification 3**

Verification 3 was performed on April 28, 1997 to ensure appropriate off-gas treatment of HVOCs stripped from extracted ground water. The normal system set-point for the off-gas high temperature shut down is 140 degrees Fahrenheit. To perform Verification 3, the system was started, and the high temperature set point was reduced to approximately 100 degrees Fahrenheit. As the system continued to operate and an off-gas temperature



of 100 degrees Fahrenheit was reached, the emergency alarm sounded and the system shut down.

### **3.4 Verification 4**

Verification 4 was performed to verify proper operation of the sump pump situated on the treatment pad. This verification was conducted by filling the sump with ground water. When the level in the sump rose to the level such that the float was actuated, the system emergency alarm sounded and the system shut down.

## *SYSTEM NON-EMERGENCY AND EQUIPMENT CHECKS*

Treatment system non-emergency verifications and equipment operational checks were conducted throughout the startup period by the contractor. These verifications were visually verified by ERM personnel. The verification procedure for each non-emergency verification and equipment check is described in Table 4-1.

Table 4-1

*Non-Emergency Verifications and Equipment Operations Checks*

Non-Emergency or Equipment Check Description	Verification Procedure
Ground Water Extraction Pump Operation	This component check was performed as part of Verification 2.
Chemical Feed System Injection Operation	During system extraction and reinjection on May 1 and 2, 1997, chemical injection to tank T-1 was visually verified during the system operation and ground water extraction.
Chemical Feed System Injection Rate	Chemical feed pump discharge hoses were temporarily disconnected. Each feed pump was set to discharge chemical solution at 2 gallons per hour (gph) into a 2 ounce jar that was filled over a measured time. Resulting calculated discharge rates of approximately 2.5 gph each were measured.
Chemical Feed System Solution Tank Low Level Switch Operation	The float switch in the solution tank was manually triggered. As a result, the low level metering light at the metering pump control box was illuminated.
Blower Operation	Blower flow rate was measured with the electronic air flow meter installed upstream of the off-gas heater, and verified utilizing a pitot tube measuring device. Resulting air flow rates were 650 cfm in each case.
Sump Pump Operation	Water was added to the sump, and the sump pump was visually confirmed to pump water into tank T-1.
Condensate Pump Operation	Water was added to the knockout drum V-3. At the high level switch in drum V-3, the condensate pump was visually verified to turn on, and the pump transmitted water to tank T-1.
Motorized Control Valve FCV-1A/B Operation	Motorized control valves verified as part of Verification 3 to respond to high and low level sump switches, and to close when air strippers V-1A and V-1B were not in operation.
Emergency Stop Button Operation	Emergency stop button was depressed, and the system shut down.

## ***PROBLEMS ENCOUNTERED***

A few problems associated with operation of the ground water treatment system were encountered during the week of startup. Problems encountered consisted of operational problems (such as chemical feed pump calibration) and mechanical problems (such as a broken flow meter). The following paragraphs discuss the problems encountered and their final or pending solution.

### **Extraction Well Flow Meter**

**Problem:** The transmitter for the flow meter at extraction well LEW-06 was not transmitting data to the motor control center.

**Solution:** The transmitter for the flow meter was replaced.

### **Extraction Well UEW-04**

**Problem:** The extraction pump in extraction well UEW-04 begins to cavitate at flowrates greater than approximately 3 gpm. This cavitation indicates that the water level in UEW-04 is drawing down below the pump impeller at extraction rates of greater than approximately 3 gpm. The system design maximum extraction rate at this extraction well is 7.5 gpm, and the anticipated extraction rate at this extraction well during normal system operation is 5 gpm.

**NOTE:** During the well performance step drawdown/recovery test conducted in January 1997, UEW experienced a drawdown of only 3.73 feet at a flow rate of 7.5 gpm. Results from the step drawdown recovery test indicated that UEW-04 would yield a constant flowrate of a least 5.0 gpm without causing adverse drawdown at the well.

**Possible Solution:** (1) The pump may not be installed at the correct depth within UEW-04 (pump intake should be set at approximately 100 feet bgs). Pump depth within UEW-04 will be verified and adjusted if necessary.

(2) The pump may be defective and will have to be replaced.

### **Influent and Effluent Pump Cycling**

**Problem:** The influent pump (P-9A/B) and the effluent pump (P-11A/B) were turning on and off too frequently for proper operation. The system was out of balance thus causing the pumps to operate for very short periods of time, which could cause undo wear and tear on the pumps.

**Solution:** The gate valves for the influent and effluent pumps were adjusted to approximately balance the two pumps to the same flow rate (about 80 gpm). In addition, the electric modulating valve (FCV-1A/B) was adjusted to further balance the two pumps.

### **Chemical Feed Pump Calibration**

**Problem:** Chemical injection pump (P-10A/B) delivered a greater volume of chemical solution than indicated by the pump meter setting.

**Solution:** The chemical injection pump was recalibrated by adjusting the pump speed and pump stroke, and measuring the resulting chemical solution volumetric delivery rate. Pump recalibration and volumetric delivery rate measurements were repeated until the correct chemical solution delivery rate was established (1.13 milliliters chemical solution delivered to the feed surge tank per 30 gallons of extracted ground water).

### **Bag Filters**

**Problem:** The bag filters in the effluent ground water filters either clogged or reached capacity twice during the first 25 days of operation.

**Pending Solution:** A sample of sediment from the bag filters will be collected and analyzed. Possible sources of solids includes sediment from the extraction wells, rust from the treatment system piping, and calcium carbonate precipitate from ground water hardness.

### **Siphoning through the Air stripper**

**Problem:** During treatment system efficiency verifications, extracted ground water was initially treated at air stripper V-1B. Following collection of an effluent sample from the sump at V-1B, the system was switched over to ground water treatment at V-1A by shutting off the power supply to blower B-1B and associated pumps (P-9B and P-11B), and turning power on at B-1A, P-9A, and P-11A. Upon shutting power down at B-1B, P-9B, and P-11B, it was noted that ground water was back-flowing from V-1B effluent piping, through V-1B, and accumulating in blower B-1B.

**Solution:** Develop an operation instruction for switching between the "A" and the "B" sides of the treatment system. This operation instruction is included in the Operation and Maintenance Manual. To switch from system operation between the "A" and the "B" sides of the system, the following procedures must be observed:

- Prior to implementing a switch-over, operate effluent pump P-11A/B and the air stripper blower B-1A/B, with influent pump P-9A/B in manual shut-off and the effluent valving from P-9A/B closed, until the low level in air stripper sump V-1A/B is reached.
- Close valves at the effluent lines on blower B-1A/B to prevent any residual water intrusion into the blower following blower shut-down. Manually shut-down power at the side of the system being taken out of operation.
- Open or close other appropriate valves associated with P-9A/B, and P-11A/B to allow water to flow to the proper air stripper.
- Turn on/off power at B-1A/B, P-9A/B, P-11A/B, and other appropriate system equipment to implement the switch-over.

### **Air Stripper Leaks**

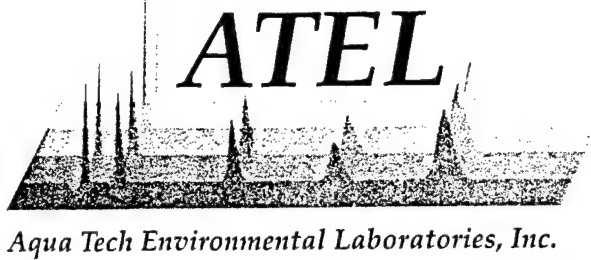
**Problem:** Leaks between the air stripper trays.

**Solution:** New seals were installed between the air stripper trays.

APPENDIX

---

*LABORATORY REPORTS*



**RECEIVED**

APR 02 1997

**ERM-WEST INC.  
PHOENIX, AZ.**

March 27, 1997

ERM-West  
5111 N. Scottsdale  
Scottsdale, AZ 85250

Attn: Steve Lamb

Laboratory I.D. 031897-17

Dear Mr. Lamb:

Enclosed are the data for samples received in our laboratory on March 18, 1997 from your project name ANG.

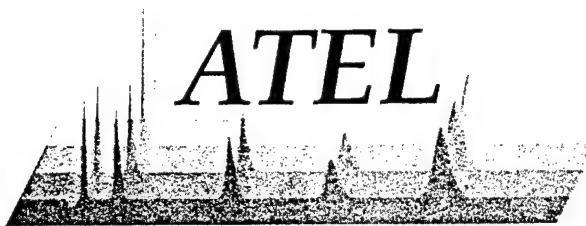
These samples were analyzed by our subcontractor Bolin Laboratories of Phoenix, Arizona.

Aqua Tech Environmental Laboratories, Inc. appreciates the opportunity to be of service.

Sincerely,

Richard A. Mosher, Ph.D.  
Laboratory Director





Aqua Tech Environmental Laboratories, Inc.

ANALYTICAL REPORT  
State of Arizona License #0009

Client:	ERM- West 5111 N. Scottsdale Scottsdale, AZ 85250 Attn: Steve Lamb	Sample I.D.	A
		Laboratory I.D.	031897-17
		Date Sampled:	3/18/97
Project Name:	ANG	Date Received:	3/18/97
Project Number:	None	Date Analyzed:	3/24/97
Client Number:	T0259	Analyzed By:	BLI

PURGEABLE HALOCARBONS  
EPA Method 601  
Reported in ug/L (ppb)

Compound	Detection Limit	Result	Compound	Detection Limit	Result
Bromodichloromethane	0.5	< 0.5	Trans-1,2-Dichloroethene	0.5	< 0.5
Bromoform	0.5	< 0.5	1,2-Dichloropropane	0.5	< 0.5
Bromomethane	0.5	< 0.5	Cis-1,3-Dichloropropene	0.5	< 0.5
Carbon Tetrachloride	0.5	< 0.5	Trans-1,3-Dichloropropene	0.5	< 0.5
Chlorobenzene	0.5	< 0.5	Methylene Chloride	0.5	< 0.5
Chloroethane	0.5	< 0.5	1,1,2,2-Tetrachloroethane	0.5	< 0.5
Chloroform	0.5	< 0.5	Tetrachloroethene	0.5	< 0.5
Chloromethane	0.5	< 0.5	1,1,1-Trichloroethane	0.5	< 0.5
2-Chloroethyl Vinyl Ether	0.5	< 0.5	1,1,2-Trichloroethane	0.5	< 0.5
Dibromochloromethane	0.5	< 0.5	Trichloroethene	0.5	< 0.5
1,2-Dichlorobenzene	0.5	< 0.5	Trichlorofluoromethane	0.5	< 0.5
1,3-Dichlorobenzene	0.5	< 0.5	Vinyl Chloride	0.5	< 0.5
1,4-Dichlorobenzene	0.5	< 0.5	Cis-1,2-Dichloroethene	0.5	< 0.5
1,1-Dichloroethane	0.5	< 0.5	Dichlorodifluoromethane	0.5	< 0.5
1,2-Dichloroethane	0.5	< 0.5			
1,1-Dichloroethene	0.5	< 0.5			

Comments: Analyzed by Bolin Laboratories  
of Phoenix, AZ

Reviewed By:

*R. Mosher*

3/27/97

Date



Aqua Tech Environmental Laboratories, Inc.

ANALYTICAL REPORT  
State of Arizona License #0009

Client:	ERM- West 5111 N. Scottsdale Scottsdale, AZ 85250 Attn: Steve Lamb	Sample I.D.	B
		Laboratory I.D.	031897-17
		Date Sampled:	3/18/97
Project Name:	ANG	Date Received:	3/18/97
Project Number:	None	Date Analyzed:	3/24/97
Client Number:	T0259	Analyzed By:	BLI

PURGEABLE HALOCARBONS  
EPA Method 601  
Reported in ug/L (ppb)

Compound	Detection Limit	Result	Compound	Detection Limit	Result
Bromodichloromethane	0.5	< 0.5	Trans-1,2-Dichloroethene	0.5	< 0.5
Bromoform	0.5	< 0.5	1,2-Dichloropropane	0.5	< 0.5
Bromomethane	0.5	< 0.5	Cis-1,3-Dichloropropene	0.5	< 0.5
Carbon Tetrachloride	0.5	< 0.5	Trans-1,3-Dichloropropene	0.5	< 0.5
Chlorobenzene	0.5	< 0.5	Methylene Chloride	0.5	< 0.5
Chloroethane	0.5	< 0.5	1,1,2,2-Tetrachloroethane	0.5	< 0.5
Chloroform	0.5	< 0.5	Tetrachloroethene	0.5	< 0.5
Chloromethane	0.5	< 0.5	1,1,1-Trichloroethane	0.5	< 0.5
2-Chloroethyl Vinyl Ether	0.5	< 0.5	1,1,2-Trichloroethane	0.5	< 0.5
Dibromochloromethane	0.5	< 0.5	Trichloroethene	0.5	< 0.5
1,2-Dichlorobenzene	0.5	< 0.5	Trichlorofluoromethane	0.5	< 0.5
1,3-Dichlorobenzene	0.5	< 0.5	Vinyl Chloride	0.5	< 0.5
1,4-Dichlorobenzene	0.5	< 0.5	Cis-1,2-Dichloroethene	0.5	< 0.5
1,1-Dichloroethane	0.5	< 0.5	Dichlorodifluoromethane	0.5	< 0.5
1,2-Dichloroethane	0.5	< 0.5			
1,1-Dichloroethene	0.5	< 0.5			

Comments: Analyzed by Bolin Laboratories  
of Phoenix, AZ

Reviewed By:

*R Mosher*

3/27/97

Date



Aqua Tech Environmental Laboratories, Inc.

**ANALYTICAL REPORT**  
State of Arizona License #0009

<b>Client:</b>	ERM- West 5111 N. Scottsdale Scottsdale, AZ 85250 Attn: Steve Lamb	<b>Sample I.D.</b>	C
		<b>Laboratory I.D.</b>	031897-17
		<b>Date Sampled:</b>	3/18/97
<b>Project Name:</b>	ANG	<b>Date Received:</b>	3/18/97
<b>Project Number:</b>	None	<b>Date Analyzed:</b>	3/24/97
<b>Client Number:</b>	T0259	<b>Analyzed By:</b>	BLI

**PURGEABLE HALOCARBONS**  
EPA Method 601  
Reported in ug/L (ppb)

Compound	Detection Limit	Result	Compound	Detection Limit	Result
Bromodichloromethane	0.5	< 0.5	Trans-1,2-Dichloroethene	0.5	< 0.5
Bromoform	0.5	< 0.5	1,2-Dichloropropane	0.5	< 0.5
Bromomethane	0.5	< 0.5	Cis-1,3-Dichloropropene	0.5	< 0.5
Carbon Tetrachloride	0.5	< 0.5	Trans-1,3-Dichloropropene	0.5	< 0.5
Chlorobenzene	0.5	< 0.5	Methylene Chloride	0.5	< 0.5
Chloroethane	0.5	< 0.5	1,1,2,2-Tetrachloroethane	0.5	< 0.5
Chloroform	0.5	< 0.5	Tetrachloroethene	0.5	< 0.5
Chloromethane	0.5	< 0.5	1,1,1-Trichloroethane	0.5	< 0.5
2-Chloroethyl Vinyl Ether	0.5	< 0.5	1,1,2-Trichloroethane	0.5	< 0.5
Dibromochloromethane	0.5	< 0.5	Trichloroethene	0.5	< 0.5
1,2-Dichlorobenzene	0.5	< 0.5	Trichlorofluoromethane	0.5	< 0.5
1,3-Dichlorobenzene	0.5	< 0.5	Vinyl Chloride	0.5	< 0.5
1,4-Dichlorobenzene	0.5	< 0.5	Cis-1,2-Dichloroethene	0.5	< 0.5
1,1-Dichloroethane	0.5	< 0.5	Dichlorodifluoromethane	0.5	< 0.5
1,2-Dichloroethane	0.5	< 0.5			
1,1-Dichloroethene	0.5	< 0.5			

Comments: Analyzed by Bolin Laboratories  
of Phoenix, AZ

Reviewed By:

*R Mosher*

3/27/97

Date



Aqua Tech Environmental Laboratories, Inc.

ANALYTICAL REPORT  
State of Arizona License #0009

Client:	ERM- West 5111 N. Scottsdale Scottsdale, AZ 85250 Attn: Steve Lamb	Sample I.D.	D
		Laboratory I.D.	031897-17
		Date Sampled:	3/18/97
Project Name:	ANG	Date Received:	3/18/97
Project Number:	None	Date Analyzed:	3/24/97
Client Number:	T0259	Analyzed By:	BLI

PURGEABLE HALOCARBONS  
EPA Method 601  
Reported in ug/L (ppb)

Compound	Detection Limit	Result	Compound	Detection Limit	Result
Bromodichloromethane	0.5	< 0.5	Trans-1,2-Dichloroethene	0.5	< 0.5
Bromoform	0.5	< 0.5	1,2-Dichloropropane	0.5	< 0.5
Bromomethane	0.5	< 0.5	Cis-1,3-Dichloropropene	0.5	< 0.5
Carbon Tetrachloride	0.5	< 0.5	Trans-1,3-Dichloropropene	0.5	< 0.5
Chlorobenzene	0.5	< 0.5	Methylene Chloride	0.5	< 0.5
Chloroethane	0.5	< 0.5	1,1,2,2-Tetrachloroethane	0.5	< 0.5
Chloroform	0.5	< 0.5	Tetrachloroethene	0.5	< 0.5
Chloromethane	0.5	< 0.5	1,1,1-Trichloroethane	0.5	< 0.5
2-Chloroethyl Vinyl Ether	0.5	< 0.5	1,1,2-Trichloroethane	0.5	< 0.5
Dibromochloromethane	0.5	< 0.5	Trichloroethene	0.5	2.5
1,2-Dichlorobenzene	0.5	< 0.5	Trichlorofluoromethane	0.5	< 0.5
1,3-Dichlorobenzene	0.5	< 0.5	Vinyl Chloride	0.5	< 0.5
1,4-Dichlorobenzene	0.5	< 0.5	Cis-1,2-Dichloroethene	0.5	< 0.5
1,1-Dichloroethane	0.5	< 0.5	Dichlorodifluoromethane	0.5	< 0.5
1,2-Dichloroethane	0.5	< 0.5			
1,1-Dichloroethene	0.5	< 0.5			

Comments: Analyzed by Bolin Laboratories  
of Phoenix, AZ

Reviewed By:

*R Mosher*

3/27/97

Date



Aqua Tech Environmental Laboratories, Inc.

ANALYTICAL REPORT  
State of Arizona License #0009

Client:	ERM- West 5111 N. Scottsdale Scottsdale, AZ 85250 Attn: Steve Lamb	Sample I.D.	E
		Laboratory I.D.	031897-17
		Date Sampled:	3/18/97
Project Name:	ANG	Date Received:	3/18/97
Project Number:	None	Date Analyzed:	3/24/97
Client Number:	T0259	Analyzed By:	BLI

PURGEABLE HALOCARBONS  
EPA Method 601  
Reported in ug/L (ppb)

Compound	Detection Limit	Result	Compound	Detection Limit	Result
Bromodichloromethane	0.5	< 0.5	Trans-1,2-Dichloroethene	0.5	< 0.5
Bromoform	0.5	< 0.5	1,2-Dichloropropane	0.5	< 0.5
Bromomethane	0.5	< 0.5	Cis-1,3-Dichloropropene	0.5	< 0.5
Carbon Tetrachloride	0.5	< 0.5	Trans-1,3-Dichloropropene	0.5	< 0.5
Chlorobenzene	0.5	< 0.5	Methylene Chloride	0.5	< 0.5
Chloroethane	0.5	< 0.5	1,1,2,2-Tetrachloroethane	0.5	< 0.5
Chloroform	0.5	< 0.5	Tetrachloroethene	0.5	< 0.5
Chloromethane	0.5	< 0.5	1,1,1-Trichloroethane	0.5	< 0.5
2-Chloroethyl Vinyl Ether	0.5	< 0.5	1,1,2-Trichloroethane	0.5	< 0.5
Dibromochloromethane	0.5	< 0.5	Trichloroethene	0.5	1.5
1,2-Dichlorobenzene	0.5	< 0.5	Trichlorofluoromethane	0.5	< 0.5
1,3-Dichlorobenzene	0.5	< 0.5	Vinyl Chloride	0.5	< 0.5
1,4-Dichlorobenzene	0.5	< 0.5	Cis-1,2-Dichloroethene	0.5	< 0.5
1,1-Dichloroethane	0.5	< 0.5	Dichlorodifluoromethane	0.5	< 0.5
1,2-Dichloroethane	0.5	< 0.5			
1,1-Dichloroethene	0.5	< 0.5			

Comments: Analyzed by Bolin Laboratories  
of Phoenix, AZ

Reviewed By:

*R. Masher*

3/27/97

Date



COMPANY ERM-West  
 ADDRESS 5111 N. Scottsdale  
 CITY Scottsdale STATE AZ ZIP 85250  
 PROJECT NAME ANG # \_\_\_\_\_  
 PROJECT MANAGER Steve Lamb SAMPLE SITE \_\_\_\_\_  
 PHONE (602) 940-9350 FAX (602) 940-0107  
 SAMPLERS SIGNATURE (REQUIRED) [Signature]

ANALYSIS REQUESTED (Circle Method, Place X in Box)

	24hr.	48hr.	72hr.	SPECIAL	TURNAROUND	TIMES
Number of Containers						
Halogenated Volatiles 601/6021						
Aromatic Volatiles 602/6021						
BTEX 6021M						
418.1A2/418.1						
8015M (BLS191)						
Pesticides/PCBs 608/6081						
Semi-Volatiles GC/MS 625/6270						
Oil & Grease						
QCOD • DTSS						
QCEN • QFlashpoint						
TCLP Metals • QVOC's						
TCLP QSVOC's • Qpest • QHerbs						
QFecal Coliforms • QBOB						
QPH						
Metals - QTotal • QDisolved (List)						
Non-Compliance						

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
A-E	3/18/97	1:50	water	031897-17
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		

**INSTRUCTIONS/COMMENTS:**  
 Composite to samples into one for EPA lab.  
 3/19/97 Steve Lamb stopped in - would like these samples to be run individually (5 sets) and would like 5 day T4 if possible. Notified Kathy in Melmore.

Reporting Requirements	Invoice Address	Reporting Requirements	Reporting Requirements
<input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> PHONE PRELIMINARY <input type="checkbox"/> FAX PRELIMINARY <input type="checkbox"/> SPECIAL QC	P.O.# <u>6021.44</u> <input type="checkbox"/> SAME AS ABOVE <input type="checkbox"/> OTHER (ATTACH INFO)	<input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> PHONE PRELIMINARY <input type="checkbox"/> FAX PRELIMINARY <input type="checkbox"/> SPECIAL QC	P.O.# <u>6021.44</u> <input type="checkbox"/> SAME AS ABOVE <input type="checkbox"/> OTHER (ATTACH INFO)
Relinquished By (Signature) <u>[Signature]</u> Relinquished By (Signature) <u>[Signature]</u> Relinquished By (Signature) <u>[Signature]</u> Relinquished By (Signature) <u>[Signature]</u>	Received By (Signature) <u>[Signature]</u> Received By (Signature) <u>[Signature]</u> Received By (Signature) <u>[Signature]</u> Received By (Signature) <u>[Signature]</u>	Date <u>3/19/97</u> Time <u>1:30</u> Date _____ Time _____ Date _____ Time _____ Date _____ Time _____	Date <u>3/19/97</u> Time <u>1:30</u> Date _____ Time _____ Date _____ Time _____ Date _____ Time _____



*Aqua Tech Environmental Laboratories, Inc.*

**RECEIVED**

MAY 05 1997

ERM-WEST INC.  
PHOENIX, AZ.

April 30, 1997

ERM-West  
5111 N. Scottsdale  
Scottsdale, AZ 85250

Attn: Steve Lamb

Laboratory I.D. 042997-11-13

Dear Mr. Lamb:

Enclosed are the data for samples received in our laboratory on April 29, 1997 from your project name ANG Tucson in house mobile lab job.

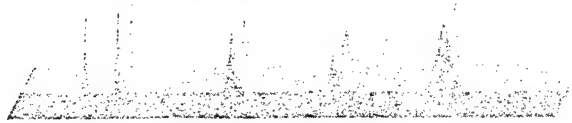
These samples were analyzed in accordance with our quality assurance program.

Aqua Tech Environmental Laboratories, Inc. appreciates the opportunity to be of service.

Sincerely,

Richard A. Mosher, Ph.D.  
Laboratory Director

# ATEL



Aqua Tech Environmental Laboratories, Inc.

RECEIVED

MAY 12 1997

ERM-WEST INC  
PHOENIX, AZ

## ANALYTICAL REPORT

State of Arizona License #0009

**Client:** ERM-West  
5111 N. Scottsdale Road, Ste. 108  
Scottsdale, AZ 85250

**Laboratory ID:** 042997-13

**Sample ID:** V-1A

**Project Name:** ANG Tucson

**Date Sampled:** 4/29/97

**Project Number:** None

**Date Received:** 4/29/97

**Client Number:** T0259

**Date Analyzed:** 4/29/97

**Analyzed By:** RAM

### HALOGENATED VOLATILE ORGANICS

EPA Method 8010  
Reported in ug/L (ppb)

Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<1.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	<1.0	1,2-Dichlorobenzene	<1.0

Internal Standard Percent Recovery

aaa-Trifluorotoluene (TFT) 98

Comments:  
Amended Report

Reviewed By: Mark Starnes 5/7/97  
Date





**ATEL****RECEIVED****MAY 12 1997****ERM-WEST INC.  
PHOENIX, AZ.***Aqua Tech Environmental Laboratories, Inc.***ANALYTICAL REPORT**  
State of Arizona License #0009

<b>Client:</b>	ERM-West 5111 N. Scottsdale Road, Ste. 108 Scottsdale, AZ 85250	<b>Laboratory ID:</b>	042997-11
		<b>Sample ID:</b>	V-1B
<b>Project Name:</b>	ANG Tucson	<b>Date Sampled:</b>	4/29/97
<b>Project Number:</b>	None	<b>Date Received:</b>	4/29/97
<b>Client Number:</b>	T0259	<b>Date Analyzed:</b>	4/29/97
		<b>Analyzed By:</b>	RAM

**HALOGENATED VOLATILE ORGANICS**  
EPA Method 8010  
Reported in ug/L (ppb)

Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<1.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	<1.0	1,2-Dichlorobenzene	<1.0

## Internal Standard Percent Recovery

aaa-Trifluorotoluene (TFT) 93

Comments:

Amended Report

Reviewed By:

*Wade S. Harris*

5/7/97

Date

# ATEL

*Aqua Tech Environmental Laboratories, Inc.*

## ANALYTICAL REPORT State of Arizona License #0009

<b>Client:</b>	ERM-West 5111 N. Scottsdale Road, Ste. 108 Scottsdale, AZ 85250	<b>Laboratory ID:</b>	042997-12
		<b>Sample ID:</b>	INF
<b>Project Name:</b>	ANG Tucson	<b>Date Sampled:</b>	4/29/97
<b>Project Number:</b>	None	<b>Date Received:</b>	4/29/97
<b>Client Number:</b>	T0259	<b>Date Analyzed:</b>	4/29/97
		<b>Analyzed By:</b>	RAM

### HALOGENATED VOLATILE ORGANICS EPA Method 8010 Reported in ug/L (ppb)

Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<1.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	17.7	1,2-Dichlorobenzene	<1.0

#### Internal Standard Percent Recovery

aaa-Trifluorotoluene (TFT) 98

Comments:  
Amended Report

Reviewed By:

*Wade H. Jones*

5/7/97

Date



2700 E. Bily Bldg. A • Tucson, AZ 85706 1776 Marion-Walke Rd. • Marion OH 4302 6878 South St. Rt. 100 • Melmore, OH 44845  
(602) 573-6565 • (800) TRY-ATEL (800) 783-5991 • Fax (614) 389-1481 (800) 858-8869 • Fax (419) 397-2229

COMPANY ERM Went TOSCI  
ADDRESS \_\_\_\_\_  
CITY SCOTTSDALE STATE AZ ZIP \_\_\_\_\_  
PROJECT NAME ANG Tucson # \_\_\_\_\_  
PROJECT MANAGER Steve Lamb SAMPLE SITE Angels Back  
PHONE (602) 990-9350 FAX (602) 990-0107  
SAMPLERS SIGNATURE (REQUIRED) [Signature]

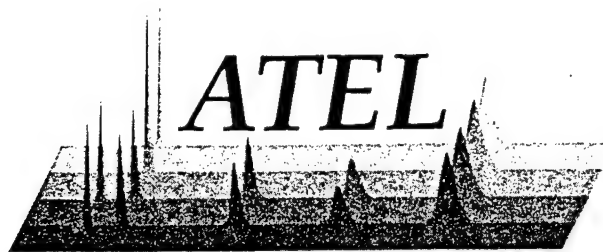
ANALYSIS REQUESTED (Circle Method, Place X in Box)

Number of Containers	
Halogenated Volatiles 601/8021	
Aromatic Volatiles 602/8021	
BTX 8021M	
418.1A/418.1	
TOX	
Pesticides/PCBs 608/8081	
Semi-Volatiles GC/MS 625/6270	
Oil & Grease • Q PH	
QCOD • QTS	
DCN • QFlashpoint	
TCLP Metals • QVOC's	
TCLP DBNA • QPest • QHerbs	
Fecal Coliforms • QBOD	
Metals (List) - QTotal • QDisolved	
Non-Compliance	
24hr. SPECIAL	
48hr. TURNAROUND	
72hr. TIMES	

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
V-1B	4/29/97	10:50	Water	42997-11
INF	4/29/97	10:55	Water	042997-12
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		
	11	:		

SAMPLE RECEIPT		REPORTING REQUIREMENTS		INVOICE ADDRESS		INSTRUCTIONS/COMMENTS:	
Rec'd In Good/Cold Condition	<input checked="" type="checkbox"/>	STANDARD	<input type="checkbox"/>	P.O.#	6021234		ERM went INC Walnut Creek, CA
CUSTODY SEALS	<input type="checkbox"/>	PHONE PRELIMINARY	<input type="checkbox"/>	SAME AS ABOVE			
TOTAL # OF CONTAINERS	4	FAX PRELIMINARY	<input type="checkbox"/>	OTHER (ATTACH INFO)			
		SPECIAL QC	<input type="checkbox"/>				
Relinquished By (Signature)	<u>[Signature]</u>	Date	Time	Received By (Signature)	Date	Time	
Relinquished By (Signature)		Date	Time	Received By (Signature)	Date	Time	
Relinquished By (Signature)		Date	Time	Received By (Signature)	Date	Time	
Relinquished By (Signature)		Date	Time	Received By (Signature)	Date	Time	

PAGE Store at:  
602-261-0957  
WMA results are in.



*Aqua Tech Environmental Laboratories, Inc.*

**RECEIVED**

**MAY 05 1997**

**ERM-WEST INC.  
PHOENIX, AZ.**

May 1, 1997

ERM-West  
5111 N. Scottsdale  
Scottsdale, AZ 85250

Attn: Steve Lamb

Laboratory I.D. 043097-10

Dear Mr. Lamb:

Enclosed are the data for samples received in our laboratory on April 30, 1997 from your project name ANG Tucson.

These samples were analyzed in accordance with our quality assurance program.

Aqua Tech Environmental Laboratories, Inc. appreciates the opportunity to be of service.

Sincerely,

Richard A. Mosher, Ph.D.  
Laboratory Director

# ATEL

Aqua Tech Environmental Laboratories, Inc.

RECEIVED

MAY 12 1997

ERM-WEST INC.  
PHOENIX, AZ

## ANALYTICAL REPORT

State of Arizona License #0009

Client: ERM-West Laboratory ID: 043097-10  
5111 N. Scottsdale Road, Ste. 108  
Scottsdale, AZ 85250 Sample ID: B-EFF

Project Name: ANG Tucson Date Sampled: 4/30/97  
Project Number: None Date Received: 4/30/97  
Client Number: T0259 Date Analyzed: 5/1/97  
Analyzed By: RAM

## HALOGENATED VOLATILE ORGANICS

EPA Method 8010

Reported in ug/L (ppm)

Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<1.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	<1.0	1,2-Dichlorobenzene	<1.0

Internal Standard Percent Recovery

aaa-Trifluorotoluene (TFT) 85

Comments:

Amended Report

Reviewed By:

*John S. Jones*

5/7/97

Date

COMPANY ERMA-VI, INC. ADDRESS 5111 N. Scottsdale Rd CITY Scottsdale STATE AZ ZIP 85252 PROJECT NAME TUCSON RING PROJECT MANAGER Steve Lova PHONE (602) 550-2250 FAX ( ) 1111 SAMPLERS SIGNATURE (REQUIRED) [Signature]

[illegible]

SAMPLE RECEIPT		REPORTING REQUIREMENTS		INVOICE ADDRESS	
Rec'd In Good/Cold Condition .... <input checked="" type="checkbox"/>		<input type="checkbox"/> STANDARD		P.O.# _____	
CUSTODY SEALS ..... <input type="checkbox"/>		<input type="checkbox"/> PHONE PRELIMINARY		<input type="checkbox"/> SAME AS ABOVE	
TOTAL # of CONTAINERS <u>3</u>		<input type="checkbox"/> FAX PRELIMINARY		<input type="checkbox"/> OTHER (ATTACH INFO)	
Relinquished By (Signature) <u>[Signature]</u>		Date	Time	Received By (Signature) <u>Michelle [Signature]</u>	
Relinquished By (Signature) _____		Date	Time	Received By (Signature) _____	
Relinquished By (Signature) _____		Date	Time	Received By (Signature) _____	
Relinquished By (Signature) _____		Date	Time	Received By (Signature) _____	

Date	Time
4/30	14:25
Date	Time
Date	Time
Date	Time

24 HOUR TAT

FAX Results to Spec Lab



*Aqua Tech Environmental Laboratories, Inc.*

**RECEIVED**

May 2, 1997

**MAY 03 1997**

ERM-West  
5111 N. Scottsdale  
Scottsdale, AZ 85250

**ERM-WEST INC.  
PHOENIX, AZ.**

Attn: Steve Lamb

Laboratory I.D. 050197-16

Dear Mr. Lamb:

Enclosed are the data for samples received in our laboratory on May 1, 1997 from your project name ANG Tucson.

These samples were analyzed in accordance with our quality assurance program.

Aqua Tech Environmental Laboratories, Inc. appreciates the opportunity to be of service.

Sincerely,

Richard A. Mosher, Ph.D.  
Laboratory Director



# ATEL

**RECEIVED**
**MAY 12 1997**
**ERM-WEST INC.  
PHOENIX, AZ.**
*Aqua Tech Environmental Laboratories, Inc.*
**ANALYTICAL REPORT**  
 State of Arizona License #0009

<b>Client:</b>	ERM-West 5111 N. Scottsdale Road, Ste. 108 Scottsdale, AZ 85250 Attn: Steve Lamb	<b>Laboratory ID:</b>	050197-16
<b>Project Name:</b>	ANG Tucson	<b>Sample ID:</b>	5-1-97-V1A
<b>Project Number:</b>	None	<b>Date Sampled:</b>	5/1/97
<b>Client Number:</b>	T0259	<b>Date Received:</b>	5/1/97
		<b>Date Analyzed:</b>	5/1/97
		<b>Analyzed By:</b>	RAM

**HALOGENATED VOLATILE ORGANICS**  
**EPA Method 8010**  
 Reported in ug/L (ppb)

Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<1.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	<1.0	1,2-Dichlorobenzene	<1.0

**Internal Standard Percent Recovery**

aaa-Trifluorotoluene (TFT) 85

 Comments:  
 Amended Report

Reviewed By:

 5/7/97

Date





*Aqua Tech Environmental Laboratories, Inc.*

**RECEIVED**

**MAY 03 1997**

**ERM-WEST INC.  
PHOENIX, AZ.**

May 2, 1997

ERM-West  
5111 N. Scottsdale  
Scottsdale, AZ 85250

Attn: Steve Lamb

Laboratory I.D. 050297-01

Dear Mr. Lamb:

Enclosed are the data for samples received in our laboratory on May 2, 1997 from your project name ANG Tucson.

These samples were analyzed in accordance with our quality assurance program.

Aqua Tech Environmental Laboratories, Inc. appreciates the opportunity to be of service.

Sincerely,

Richard A. Mosher, Ph.D.  
Laboratory Director

# ATEL

RECEIVED

MAY 12 1997

ERM-WEST INC.  
PHOENIX, AZ

Aqua Tech Environmental Laboratories, Inc.

## ANALYTICAL REPORT

State of Arizona License #0009

<b>Client:</b>	ERM-West 5111 N. Scottsdale Road, Ste. 108 Scottsdale, AZ 85250 Attn: Steve Lamb	<b>Laboratory ID:</b>	050297-01
		<b>Sample ID:</b>	5-2-97-V1A
<b>Project Name:</b>	ANG Tucson	<b>Date Sampled:</b>	5/2/97
<b>Project Number:</b>	None	<b>Date Received:</b>	5/2/97
<b>Client Number:</b>	T0259	<b>Date Analyzed:</b>	5/2/97
		<b>Analyzed By:</b>	RAM

### HALOGENATED VOLATILE ORGANICS

EPA Method 8010  
Reported in ug/L (ppb)

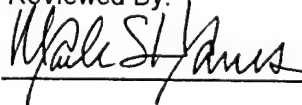
Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<1.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	<1.0	1,2-Dichlorobenzene	<1.0

#### Internal Standard Percent Recovery

aaa-Trifluorotoluene (TFT)	85
----------------------------	----

Comments:  
Amended Report

Reviewed By:



5/7/97

Date



## ANALYSIS REQUESTED (Circle Method, Place X in Box)

SPECIAL		TURNAROUND		TIMES	
24hr.		48hr.		72hr.	
Non-Compliance					
80/10					
Metals (Lbs) - Q Total • Q Dissolved					
QFecal Coliforms • QBOD					
TCLP • DBNA • Q Pest • Q Herbs					
TCLP • Metals • Q VOC's					
QCN • Q Flashpoint					
QCOD • Q TSS					
Q Oil & Grease • Q PH					
Semi-Volatiles GC/MS 625/8270					
Pesticides/PCB's 608/8081					
TOX					
418.1A2/418.1					
BTEX 8021M					
Aromatic Volatiles 602/8021					
Halogenated Volatiles 601/8021					
Number of Containers					

A blank sheet of graph paper with a grid pattern. The top-left corner has a small square containing the letter 'X'. The bottom-left corner has a small square containing the number '2'.

SAMPLE RECEIPT		REPORTING REQUIREMENTS		INVOICE ADDRESS		INSTRUCTIONS/COMMENTS:	
REC'D IN GOOD/COLD CONDITION .....	<input type="checkbox"/>	<input type="checkbox"/> STANDARD	P.O.# .....			24 HOUR TAT	
CUSTODY SEALS .....	<input type="checkbox"/>	<input type="checkbox"/> PHONE PRELIMINARY	<input type="checkbox"/> SAME AS ABOVE				
		<input type="checkbox"/> FAX PRELIMINARY	<input type="checkbox"/> OTHER (ATTACH INFO)				
TOTAL # OF CONTAINERS .....		<input type="checkbox"/> SPECIAL QC					
Relinquished By (Signature) <i>[Signature]</i>		Date <i>5/29/00</i>	Time <i>0805</i>	Received By (Signature) <i>[Signature]</i>		Date <i>5/29/00</i>	Time <i>0805</i>
Relinquished By (Signature)				Received By (Signature)		Date	Time
Relinquished By (Signature)				Received By (Signature)		Date	Time
Relinquished By (Signature)				Received By (Signature)		Date	Time

6021.34

# ATEL

*Aqua Tech Environmental Laboratories, Inc.*

**RECEIVED**

**MAY 12 1997**

**ERM-WEST INC.  
PHOENIX, AZ**

May 7, 1997

ERM-West  
5111 N. Scottsdale  
Scottsdale, AZ 85250

Attn: Steve Lamb

Laboratory I.D. 050697-02

Dear Mr. Lamb:

Enclosed are the data for samples received in our laboratory on May 6, 1997 from your project name ANG Tucson.

These samples were analyzed in accordance with our quality assurance program.

Aqua Tech Environmental Laboratories, Inc. appreciates the opportunity to be of service.

Sincerely,

*Richard A. Mosher* FOR

Richard A. Mosher, Ph.D.  
Laboratory Director

# ATEL

*Aqua Tech Environmental Laboratories, Inc.*

## ANALYTICAL REPORT State of Arizona License #0009

<b>Client:</b>	ERM-West 5111 N. Scottsdale Scottsdale, AZ 85250 Attn: Steve Lamb	<b>Laboratory ID:</b>	050697-02
<b>Project Name:</b>	ANG-Tucson	<b>Sample ID:</b>	1
<b>Project Number:</b>	None	<b>Date Sampled:</b>	5/6/97
<b>Client Number:</b>	T0259	<b>Date Received:</b>	5/6/97
		<b>Date Analyzed:</b>	5/7/97
		<b>Analyzed By:</b>	MSH

### HALOGENATED VOLATILE ORGANICS EPA Method 8010 Reported in ug/L (ppb)

Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<1.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	<1.0	1,2-Dichlorobenzene	<1.0

#### Internal Standard Percent Recovery

aaa-Trifluorotoluene (TFT) 92

Comments:

Reviewed By:

*Paul S. James*

5/7/97

Date

COMPANY ERM West, Inc 702 57  
ADDRESS 5111 N. Southdale  
CITY Southdale STATE AZ ZIP 85250  
PHONE 602-990-9350 FAX \_\_\_\_\_  
CONTACT NAME Steve Lamb # \_\_\_\_\_

REQUIRED INFORMATION	
SYSTEM NAME _____	SYSTEM ID (PWS#) _____
SYSTEM COLLECTION POINT _____	DWR# _____
SAMPLERS NAME (print) _____	CITY _____
SAMPLERS SIGNATURE _____	POE# _____

[illegible]

SAMPLE RECEIPT		REPORTING REQUIREMENTS		INVOICE ADDRESS
Rec'd In Good/Cold Condition .....	<input type="checkbox"/>	<input type="checkbox"/> REPORT TO ADEQ	<input type="checkbox"/> SAME AS ABOVE <input checked="" type="checkbox"/> OTHER (ATTACH INFO)	P.O.# <u>602-134</u>
CUSTODY SEALS .....	<input type="checkbox"/>	<input type="checkbox"/> REPORT TO PDEQ		Received By (Signature) <u>[Signature]</u> Received By (Signature) Received By (Signature)
TOTAL # OF CONTAINERS <u>2</u>		<input type="checkbox"/> TO CLIENT		Received By (Signature) Received By (Signature) Received By (Signature)
Relinquished By (Signature) <u>[Signature]</u> Relinquished By (Signature)		Date <u>5/6/97</u> Date	Time <u>3:02</u> Time	
Relinquished By (Signature) <u>[Signature]</u> Relinquished By (Signature)		Date Date	Time Time	
Relinquished By (Signature) <u>[Signature]</u> Relinquished By (Signature)		Date Date	Time Time	

	<b>INSTRUCTIONS/COMMENTS:</b>	
-	INVOICE TO Walnut Creek, CA office	
D	ADEQ Forms: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
	<i>Air</i> Date <b>5/6/97</b> Date	Time <b>1500</b> Time
	Date	Time
	Date	Time



# ATEL

*Aqua Tech Environmental Laboratories, Inc.*

May 12, 1997

**RECEIVED**

MAY 16 1997

ERM-West  
5111 N. Scottsdale  
Scottsdale, AZ 85250

ERM-WEST INC.  
PHOENIX, AZ.

Attn: Steve Lamb

Laboratory I.D. 050997-11-12

Dear Mr. Lamb:

Enclosed are the data for samples received in our laboratory on May 9, 1997 from your project name ANG Tucson.

These samples were analyzed in accordance with our quality assurance program.

Aqua Tech Environmental Laboratories, Inc. appreciates the opportunity to be of service.

Sincerely,



Richard A. Mosher, Ph.D.  
Laboratory Director

# ATEL

*Aqua Tech Environmental Laboratories, Inc.*

## ANALYTICAL REPORT State of Arizona License #0009

Client:	ERM-West 5111 N. Scottsdale Rd, Suite 108 Scottsdale, AZ 85250 Attn: Steve Lamb	Laboratory ID:	050997-11
Project Name:	ANG-Tucson	Sample ID:	Stripper In
Project Number:	None	Date Sampled:	5/9/97
Client Number:	T0259	Date Received:	5/9/97
		Date Analyzed:	5/11/97
		Analyzed By:	MSH

### HALOGENATED VOLATILE ORGANICS EPA Method 8010 Reported in ug/L (ppb)

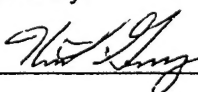
Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<5.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	18.3	1,2-Dichlorobenzene	<1.0

#### Internal Standard Percent Recovery

2-Bromo-1-chloropropane 102

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewed By:



5/12/97  
Date

# ATEL

*Aqua Tech Environmental Laboratories, Inc.*

## ANALYTICAL REPORT

State of Arizona License #0009

<b>Client:</b>	ERM-West 5111 N. Scottsdale Rd, Suite 108 Scottsdale, AZ 85250 Attn: Steve Lamb	<b>Laboratory ID:</b>	050997-12
<b>Project Name:</b>	ANG-Tucson	<b>Sample ID:</b>	Stripper Out
<b>Project Number:</b>	None	<b>Date Sampled:</b>	5/9/97
<b>Client Number:</b>	T0259	<b>Date Received:</b>	5/9/97
		<b>Date Analyzed:</b>	5/11/97
		<b>Analyzed By:</b>	MSH

## HALOGENATED VOLATILE ORGANICS

EPA Method 8010

Reported in ug/L (ppb)

Compound	Results	Compound	Results
Dichlorodifluoromethane	<1.0	1,2-Dichloropropane	<1.0
Chloromethane	<1.0	Bromodichloromethane	<1.0
Vinyl Chloride	<1.0	2-Chloroethyl Vinyl Ether	<5.0
Bromomethane	<1.0	cis-1,2-Dichloroethene	<1.0
Chloroethane	<1.0	cis-1,3-Dichloropropene	<1.0
Trichlorofluoromethane	<1.0	trans-1,3-Dichloropropene	<1.0
1,1-Dichloroethene	<1.0	1,1,2-Trichloroethane	<1.0
Methylene Chloride	<1.0	Tetrachloroethene	<1.0
Trans-1,2-Dichloroethene	<1.0	Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0	Chlorobenzene	<1.0
Chloroform	<1.0	Bromoform	<1.0
1,1,1-Trichloroethane	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Carbon Tetrachloride	<1.0	1,3-Dichlorobenzene	<1.0
1,2-Dichloroethane	<1.0	1,4-Dichlorobenzene	<1.0
Trichloroethene	<1.0	1,2-Dichlorobenzene	<1.0

### Internal Standard Percent Recovery

2-Bromo-1-chloropropane 103

Comments:

Reviewed By:

*Theresa Chung*

5/12/97  
Date

